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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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CAMPBELL STEPHENSON ASCOLESE, LLP			NORRIS, JEREMY C	
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BLDG. 4, SUITE 201			PAPER NUMBER	
AUSTIN, TX 78759			2841	

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Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary

Application No.

10/727,381

Applicant(s)

PARAMESWARAN ET AL.

Examiner

Jeremy C. Norris

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

The drawings are objected to because the sectional views are not properly cross-hatched (see MPEP 608.02). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claim 34 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 34 recites the limitation "BGA connectors" in lines 2 and 3. There is insufficient antecedent basis for this limitation in the claim. For examination purposes, the Examiner assumes that claim 34 was intended to depend from claim 33 since claim 33 mentions BGA connectors.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4, 7-12, 14-18, 20, 21, 25, 26, 28, 29, and 35-44 rejected under 35 U.S.C. 102(e) as being anticipated by US 2005/007797 A1 (Beale).

Beale discloses, referring primarily to figures 3-4E, a printed circuit board, comprising: a substrate ([0034]); a first pair of vias (14, 18) in the substrate; and a second pair of vias (24, 28) in the substrate; wherein the first pair of vias is configured to convey a first signal pair and the second pair of vias is configured to convey a second signal pair ([0034]); the first pair of vias is positioned in a first plane, the first plane is

substantially equidistant from each via in the second pair of vias, the second pair of vias is positioned in a second plane, the second plane is substantially equidistant from each via in the first pair of vias (figure 4A) [claim 1], wherein the first signal pair is a first differential signal pair, and the second signal pair is a second differential signal pair ([0034]) [claim 2], further comprising: a first differential signal source coupled to each via in the first pair of vias, wherein the first differential signal source is configured to generate the first differential signal pair conveyed by the first pair of vias ([0051]) [claim 4], wherein a skew of a first pair of traces is matched at a point at which the first pair of traces couples to the first pair of vias ([0013]-[0019], figures 7, 8A, 8B) [claim 7], wherein a skew of a second pair of traces is matched at a point at which the second pair of traces couples to the second pair of vias ([0013]-[0019], figures 7, 8A, 8B) [claim 8], wherein the first pair of traces are routed on a same layer as the second pair of traces (figure 4A) [claim 9], wherein the first pair of traces are routed on an adjacent layer to the second pair of traces ([0060]) [claim 10], wherein the first pair of vias is configured to convey a positive differential signal and a negative differential signal; the first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the second signal pair on the positive differential signal reduces a crosstalk effect caused by the second signal pair of the negative differential signal ([0039]-[0048]) [claim 11], wherein the first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the second signal pair on the positive differential signal substantially cancels a crosstalk effect caused by the second signal pair of the negative differential signal ([0039]-[0048]) [claim 12].

Similarly, Beale discloses, a printed circuit board, comprising: a substrate ([0034]) a first pair of vias (14, 18) in the substrate; and a second pair of vias (24, 28) in the substrate, wherein the first pair of vias is configured to convey a first signal pair comprising a first positive signal and a first negative signal ([0039]-[0048]), the second pair of vias is configured to convey a second signal pair comprising a second positive signal and a second negative signal ([0039]-[0048]), the first pair of vias is positioned relative to the second pair of vias such that a crosstalk effect caused by the first signal pair on the second positive signal reduces a crosstalk effect caused by the first signal pair on the second negative signal ([0039]-[0048]) [claim 14], wherein the second pair of vias is positioned relative to the first pair of vias such that a crosstalk effect caused by the second signal pair on the first positive signal reduces a crosstalk effect caused by the second signal pair on the first negative signal ([0039]-[0048]) [claim 15], wherein the first positive signal and the first negative signal are comprised in a first differential signal pair, and the second positive signal and the second negative signal are comprised in a second differential signal pair ([0039]-[0048]) [claim 16], wherein a skew of a first pair of traces is matched at a point at which the first pair of traces couples to the first pair of vias ([0013], [0019], figures 7, 8A-B) [claim 17], wherein a skew of a second pair of traces is matched at a point at which the second pair of traces couples to the second pair of vias ([0013], [0019], figures 7, 8A-B) [claim 18].

Additionally, Beale discloses, a method, comprising: conveying a first signal pair (10a), wherein a first pair of vias (14, 18) convey the first signal pair; and conveying a second signal pair (10b), wherein a second pair of vias (24, 28) convey the second

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signal pair, wherein the first pair of vias is positioned in a first plane, the first plane is substantially equidistant from each via in the second pair of vias, the second pair of vias is positioned in a second plane, and the second plane is substantially equidistant from each via in the first pair of vias [claim 20], wherein the first signal pair is a first differential signal pair, and the second signal pair is a second differential signal pair ([0039]-[0048]) [claim 21], wherein a skew of a first pair of traces is matched at a point at which the first pair of traces couples to the first pair of vias ([0013], [0019], figures 7, 8A-B) [claim 25], wherein a skew of a second pair of traces is matched at a point at which the second pair of traces couples to the second pair of vias ([0013], [0019], figures 7, 8A-B) [claim 26].

Moreover, Beale discloses, a method, comprising: forming a first pair of vias (14, 18) in a substrate ([0034]), wherein the first pair of vias is positioned in a first plane; forming a second pair of vias (24, 28) in the substrate, wherein the second pair of vias is positioned in a second plane; coupling the first pair of vias to receive a first signal pair (10a); and coupling the second pair of vias to receive a second signal pair (10b), wherein the first plane is substantially equidistant from each via in the second pair of vias, and the second plane is substantially equidistant from each via in the first pair of vias [claim 28], wherein the first signal pair is a first differential signal pair, and the second signal pair is a second differential signal pair ([0039]-[0048]) [claim 29], further comprising matching a first skew of a first pair of traces at a point at which the first pair of traces couples to the first pair of vias ([0013], [0019], figures 7, 8A-b) [claim 35], further comprising matching a second skew of a second pair of traces at a point at

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which the second pair of traces couples to the second pair of vias ([0013], [0019], figures 7, 8A-b) [claim 36], further comprising forming the first pair of traces on a same layer as the second pair of traces (figure 4A) [claim 37].

Furthermore, Beale discloses, an integrated circuit [0001]), comprising: core circuitry (figure 6B) configured to process a first signal pair (10a) and a second signal pair (10b); a first pair of leads (14, 18) coupled to the core circuitry and configured to convey the first signal pair; and a second pair of leads (24, 28) coupled to the core circuitry and configured to convey the second signal pair, wherein the first pair of leads is positioned in a first plane, the first plane is substantially equidistant from each lead in the second pair of leads, the second pair of leads is positioned in a second plane, and the second plane is substantially equidistant from each lead in the first pair of leads [claim 38], wherein the first signal pair is a first differential signal pair, and the second signal pair is a second differential signal pair ([0039]-[0048]) [claim 39].

In addition, Beale discloses, an apparatus, comprising: a substrate ([0034]); means for conveying a first positive signal (12); means for conveying a first negative signal (12'); means for conveying a second positive signal (22); and means for conveying a second negative signal (22'), wherein the means for conveying the first positive signal, the means for conveying the first negative signal, the means for conveying the second positive signal, and the means for conveying the second negative signal are located in the substrate (figure 4A), the first positive signal and the first negative signal are comprised in a first signal pair (10a), the second positive signal and the second negative signal are comprised in a second signal pair (10b), the means for conveying

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the first positive signal and the means for conveying the first negative signal are positioned in a first plane, the first plane is substantially equidistant from the means for conveying the second positive signal and the means for conveying the second negative signal, the means for conveying the second positive signal and the means for conveying the second negative signal are positioned in a second plane (figure 4A), and the second plane is substantially equidistant from the means for conveying the first positive signal and the means for conveying the first negative signal (figure 4A) [claim 40], wherein the first signal pair is a first differential signal pair, and the second signal pair is a second differential signal pair ([0039]-[0048]) [claim 41], further comprising: means for generating the first differential signal pair, wherein the means for generating are coupled to the means for conveying the first positive signal and to the means for conveying the first negative signal ([0051]-[0052]) [claim 42], wherein the means for conveying the first positive signal and the means for conveying the first negative signal are positioned relative to the means for conveying the second positive signal and the means for conveying the second negative signal such that a crosstalk effect caused by the first signal pair on the second positive signal reduces a crosstalk effect caused by the first signal pair on the second negative signal ([0039]-[0048]) [claim 43] the means for conveying the first positive signal and the means for conveying the first negative signal are positioned relative to the means for conveying the second positive signal and the means for conveying the second negative signal such that the crosstalk effect caused by the first signal pair on the second positive signal substantially cancels the crosstalk

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effect caused by the first signal pair on the second negative signal ([0039]-[0048]) [claim 44].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claims 3, 19, 22, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale in view of US 2004/0150970 A1 (Lee) and US 6,008,534 (Fulcher).

Regarding claim 3, Beale discloses the claimed invention as described above except Beale does not specifically disclose a plurality of Ball Grid Array (BGA) connectors, wherein each via in the first pair of vias and the second pair of vias is coupled to a respective one of the plurality of BGA connectors [claims 3, 19, 22, 33]. However, it is well known in the art to couple differential signal pair vias to connectors as evidenced by Lee (signal pads 22, figure 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to couple the via pairs in the invention of Beale to connectors as is known in the art and evidenced by Lee. The motivation for doing so would have been to allow signal transmission between the invention and an external device. Additionally, it is well known in the art to form connectors as BGA connectors as evidenced by Fulcher (col. 2, lines 1-30). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form BGA connectors in the invention of Beale as is known in the art and evidenced by Fulcher. The motivation for doing so would have been to allow for communication with a BGA device, a popular mode of chip packaging in the art (Fulcher, col. 2, lines 1-30). Additionally, the modified invention of Beale teaches further comprising: coupling a first differential signal source to the pair of BGA connectors (Beale [0051]-[0052]) [claim 34].

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale in view of US 2002/0130739 A1 (Cotton).

Beale discloses the claimed invention as described above except Beale does not specifically state a plurality of isolation vias, wherein the plurality of isolation vias substantially electromagnetically isolate the first pair of vias and the second pair of vias from a third pair of vias and a fourth pair of vias [claim 5]. However, Beale teaches that any number of differential pairs, and thus any number of signal lines may be included in the device ([0052]), therefore it would have been obvious to one having ordinary skill in the art at the time of invention to include a third and fourth pair of vias with a third and fourth differential pair. The motivation for doing so would have been to allow for more simultaneous signal transmission. Additionally, it is well known in the art to provide isolation vias between vias of differential pairs as evidenced by Cotton (figures 5, 12, vias 524, 526). Moreover, Beale teaches adding additional shielding to the invention ([0061]). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include isolation vias to isolate the first and second via pairs from the third and fourth via pairs. The motivation for doing so would have been to further enhance the shielding of the invention.

Regarding claim 6, although the modified invention of Beale does not explicitly teach that the third pair of vias and the fourth pair of vias are each configured to convey a respective differential signal pair, the third pair of vias is positioned in a third plane, the third plane is substantially equidistant from each via comprised in the fourth pair of vias, the fourth pair of vias is positioned in a fourth plane, and the fourth plane is

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substantially equidistant from each via included in the third pair of vias [claim 6], such a modification would be a mere duplication of the arrangement explicitly disclosed by Beale (figure 4A). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention form the invention such that the third pair of vias and the fourth pair of vias are each configured to convey a respective differential signal pair, the third pair of vias is positioned in a third plane, the third plane is substantially equidistant from each via comprised in the fourth pair of vias, the fourth pair of vias is positioned in a fourth plane, and the fourth plane is substantially equidistant from each via included in the third pair of vias. The motivation for doing so would have been to ensure that the cross-talk between the signal pairs is minimized (Beale [0039]-[0048]).

Claims 13, 23, 27, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale.

Regarding claims 13 and 27, Beale discloses the claimed invention as described above except Beale does not specifically state that in the conveying the first differential signal pair comprises conveying the first differential signal pair at a data rate greater than 250 megabits per second [claims 13, 27]. Instead, Beale generically teaches that the signals conveyed are "high-speed" ([0051]). It is well known in the art that data rates greater than 250 megabits per second are "high speed" and are thus contemplated in the invention of Beale. Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to convey the first differential signal pair at a "high-speed" data rate greater than 250 megabits per second in the

invention of Beale. The motivation for doing so would have been to allow for quick and efficient data transmission.

Regarding claims 23 and 30, Beale discloses the claimed invention as described above except Beale does not explicitly disclose that the third pair of vias and the fourth pair of vias are each configured to convey a respective differential signal pair, the third pair of vias is positioned in a third plane, the third plane is substantially equidistant from each via comprised in the fourth pair of vias, the fourth pair of vias is positioned in a fourth plane, and the fourth plane is substantially equidistant from each via included in the third pair of vias [claims 23, 30], such a modification would be a mere duplication of the arrangement explicitly disclosed by Beale (figure 4A). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention from the invention such that the third pair of vias and the fourth pair of vias are each configured to convey a respective differential signal pair, the third pair of vias is positioned in a third plane, the third plane is substantially equidistant from each via comprised in the fourth pair of vias, the fourth pair of vias is positioned in a fourth plane, and the fourth plane is substantially equidistant from each via included in the third pair of vias. The motivation for doing so would have been to ensure that the cross-talk between the signal pairs is minimized (Beale [0039]-[0048]).

Claims 24, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale as applied to claims 23 and 30 (respectively) above, and further in view of Cotton.

The modified invention of Beale teaches the claimed invention as described above except the modified invention of Beale does not specifically teach, wherein the first pair of vias and the second pair of vias are substantially electromagnetically isolated from the third pair of vias and the fourth pair of vias [claims 24, 31]. However, it is well known in the art to provide isolation vias between vias of differential pairs as evidenced by Cotton (figures 5, 12, vias 524, 526). Moreover, Beale teaches adding additional shielding to the invention ([0061]). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include isolation vias to isolate the first and second via pairs from the third and fourth via pairs. The motivation for doing so would have been to further enhance the shielding of the invention. Additionally, the twice modified invention of Beale teaches wherein the substantially electromagnetically isolating comprises forming a plurality of isolation vias in the substrate (Cotton figures 5, 12, vias 524, 526) [claim 32].

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following documents disclose signal pairs:

US 5,646,368	Muyshondt et al.,
US 6,743,985 B1	Greim et al.,

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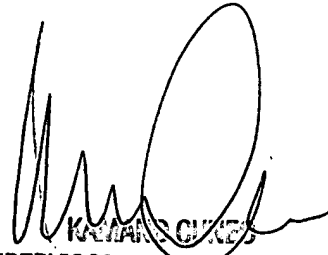
US 2002/0179332 A1 Uematsu et al..

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremy C. Norris whose telephone number is 571-272-1932. The examiner can normally be reached on Monday - Friday, 9:30 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JCSN



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